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**1 ELECTRONIC KEY WITH OPTICAL SCANNER**

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WO9735442  
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A key for accessing an electronic lock that also has an optical scanner includes a user interface, first and second memories and a shared data transfer circuit. The first memory serves to store access data detailing identities of locks accessed by the key. The second memory stores data scanned by the scanner. The access data and the scanned data can both be downloaded from the key via the shared data transfer circuit.

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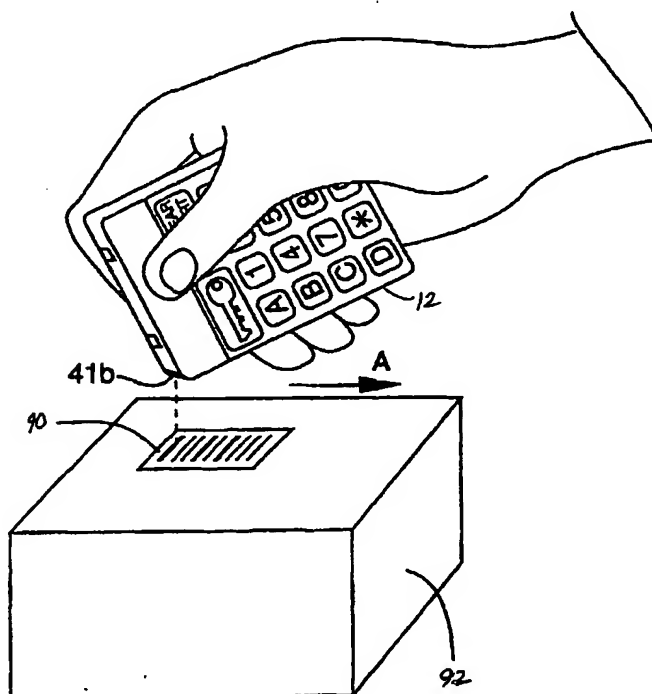
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[Continued on next page]

(54) Title: ELECTRONIC KEY WITH OPTICAL SCANNER



(57) Abstract: A key for accessing an electronic lock that also has an optical scanner includes a user interface, first and second memories and a shared data transfer circuit. The first memory serves to store access data detailing identities of locks accessed by the key. The second memory stores data scanned by the scanner. The access data and the scanned data can both be downloaded from the key via the shared data transfer circuit.

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## ELECTRONIC KEY WITH OPTICAL SCANNER

### Background

5 Security systems that provide for authorized access to a secured area through use of an electronic key are known. Various of the present assignee's patents and applications detail electronic keys useful in various site security applications.

These keys, and others, are commonly used by suppliers to make after-hours deliveries to their customers (e.g., french fries to restaurants, auto parts to car dealerships, etc.). After-hours pickups can likewise be made.

10 Typically, the door lock at the customer premises is electronic. The delivery driver couples the electronic key to the lock, and manipulates the key so as to unlock the lock (e.g., by entering a PIN number). The driver can then open the door and make the delivery. (In other cases, the door lock is conventional, i.e., mechanical. Such installations commonly have a small vault mounted near the door containing a  
15 mechanical door key secured on a short tether. The vault has an electronic lock and is unlocked by the driver with the electronic key. The driver can then access the mechanical key and use it to open the adjoining door.)

One advantage of such electronic keys is that they typically include a memory for logging access data (e.g., IDs of accessed locks, time of access, etc.).  
20 This data can then be downloaded into a database so as to document which driver made a delivery to which customer at which time. (Various known coupling techniques can be used to download the data from the key to a computer on which the database is maintained, e.g., infrared coupling, magnetic coupling, inductive coupling, capacitive coupling, electrical contacts coupling, etc.)

25

### Summary

The foregoing functionality is improved by integrating into the key an optical scanner so that, e.g., the delivery driver can use a common device both for access and inventory tracking. One particular type of optical scanner is a bar code  
30 reader used for reading bar code information, as is widely used today. The bar code inventory data scanned into the key is downloaded into a database – either with the access data or separately – to provide further detail about the deliveries.

### Brief Description of the Drawings

35 Fig. 1 is a pictorial view of an electronic key with an optical scanner shown in relation to one type of device accessed by the key.

Fig. 2 is a schematic block diagram of an electronic key.

Fig. 3 is a pictorial view showing the key of Fig. 1 being used to scan optically encoded information on an object.

5 Figs. 4, 5 and 6 are front, right side and pictorial views, respectively, of a key with an optical scanner according to a second embodiment.

Fig. 7 is a front view of a key with an optical scanner according to a third embodiment, showing the optical scanner pivoted outwardly from the case in its operating position.

10 Figs. 8, 9 and 10 are front, right side and pictorial views, respectively, of a stand shaped to receive the key of Figs. 4, 5 and 6 or Fig. 7.

#### **Detailed Description of Preferred Embodiments**

In an exemplary embodiment, an electronic key is equipped with an optical scanning circuit that includes an optical scanning element. One such circuit,  
15 which is suited to reading optically encoded information in the form of bar codes, includes a sapphire bar code sensor tip, a bar code reader sensor, and a bar code decoding chip, all of which parts are commonly available (e.g., Hewlett-Packard part numbers HBCS-A999, HBCS-1570, and HBCR-1610, respectively).

20 A common memory in the key can store both the access data and the bar code inventory data, or separate memories can be provided. One particular arrangement has 4-5K of memory allocated for storage of the bar code inventory data (e.g., permitting storage of data about 1000 items, each encoded with a four byte bar code item number, accompanied by 4-byte data indicating the site(s) visited, and 4-byte data indicating the number of items).

25 Some electronic keys include LCD displays as a part of the key's user interface (UI). The software that implements the LCD UI can be adapted to provide user controls useful for bar code scanning operations as well. Hardware keys (themselves a form of UI) can have dual functionality, serving, e.g., to effect an unlocking operation when the key is in a first (key) mode, and to effect a scanning  
30 operation when the key is in a second (scanner) mode. Buttons presented on a UI display can likewise have dual functionality, or a UI unique to the scanning mode can be presented.

In one particular arrangement, the "Display" button on a key serves, when in bar code mode, to initiate one or more bar code reading operations. After  
35 operating the button, the user is prompted to indicate (by operation of numeric keys or otherwise) the number of packages that will be scanned. Once this number is entered,

the delivery driver then scans respective bar code from each of the packages, the logging of each bar code being confirmed by an audible beep. (The key can be toggled between key and scanner modes by repeated operation of a single button.)

5 Just as courier services (e.g., Federal Express, UPS, etc.) employ bar code scanners to track data, time, and quantity of package deliveries, a key adapted in accordance with the present invention can be similarly used. Moreover, since the key also provides access control, data is additionally digitally logged to specify the location at which deliveries (or pick-ups) were made. (The user ID is also unambiguously indicated by key assignment and proper entry of the user's PIN code.)

10 If desired, a bar code identifying a facility can be mounted on or near the door through which deliveries are made (preferably inside, so as to prevent vandalism), permitting the delivery driver to optically scan that data into the device as well. (Such data would commonly be redundant of the lock ID logged with the access data, but may be desirable in certain instances.) In some applications, plural bar codes  
15 may be so-mounted, each differently encoded. These different codes can represent, for example, different actions undertaken by the delivery person, or different purposes for the visit.

From the foregoing, it will be recognized that the preferred embodiment of the present invention provides enhanced functionality for electronic keys, permitting  
20 them to perform automated inventory tracking and management at only marginally increased cost, by making dual use of the key and/or its memory, and/or the coupling means, and/or the data collection database.

It will be recognized that this technology is not limited to use by delivery drivers and for use in tracking inventory. To illustrate the diversity of  
25 applications, consider a telephone cell transmitter site. The facility is usually locked but is accessed periodically by technicians. An electronic lock can be used, just as in the delivery context detailed above. When entering or leaving the building, the technician can scan one of several bar codes positioned by the door indicating the purpose of the visit, e.g., to check the transmitter, to backup computer data, to check  
30 battery status, to check premises security, etc.

In addition, the system can be configured to record the technician's activity at the cell transmitter site. Components at the site can be bar coded, and the technician can be required to scan the bar code of each component that is accessed, inspected, adjusted, replaced, etc. In the case of a replaced component, the  
35 technician scans both the component to be replaced and the replacement component. This information can be collected to provide a profile of the components that require

service or replacement most frequently, the time required to service or replace a particular component, the time spent on service operations by a particular technician, etc.

5 All of the data collected in the keys is for naught if it is not transferred to the database. According to one known system, if logged data is not periodically downloaded from the key, incentive data is withheld from the key user. This incentive data can be an update code that must be entered into the key every week or month to keep the key functioning. Thus, if the data is not downloaded, the key soon loses its functionality.

10 Further specific implementations of the electronic key with the optical scanner are described below. A first embodiment of an electronic key 12 is shown in Fig. 1.

As shown in Fig. 1, the electronic key 12 is shown in its relation to one exemplary type of secured access device, i.e., a key vault 16, with which it can be used. The vault 16 includes a body 20 and removable lid 18 and is constructed for outdoor use. As shown, lid 18 has a recess 18a within which key 12 is inserted to make electrical contact between key 12 and a lock mechanism in the key vault 16.

15 The key 12 interfaces with other secured access devices, such as an electronic door lock, similarly. In addition, and as described in greater detail below, key 12 may communicate by infrared transmission in addition to or instead of direct electrical contact.

As shown in Fig. 2, key 12 has a case 13 with a keypad 24. The case 13 houses a CPU 26, RAM and ROM memories 28, 30, a battery 32, a calendar/clock circuit 34, a piezoelectric transducer 36 with associated modulator 38, a communications interface 40 and an optical scanning circuit 41a.

25 As illustrated in Fig. 1, the case 13 may be constructed as a trim polycarbonate enclosure sized to fit conveniently in a user's pocket. An optical scanning element 41b is positioned at the surface of the case 13 as shown in an upper left-hand corner of the key 12. Alternatively, the optical scanning element 41b can be positioned at other locations, provided that (1) the key 12 can be conveniently held while executing a bar code reading operation and (2) the overall shape of the key 12 remains generally unchanged (such that the key 12 can still interface with secure access devices (such as the vault 16).

30 As shown in Fig. 1 (and schematically in Fig. 2), the upper left-hand corner of the enclosure is slightly rounded to facilitate moving the key 12 across a surface having a bar code with the optical scanning element 41b being maintained in

contact with or within a specified distance from the bar code. Fig. 3 shows a user holding the key 12 and moving it in a direction A across a bar code 90 on an object 92. The operative distance at which the key 12 can read the bar code 90 depends upon the particular type of scanning element 41b used, and may range from approximately in contact with the object 92 to approximately one foot or more from the object.

In the illustrated implementation, the optical scanning element 41b includes a sapphire tip. As is known to those of ordinary skill in the art, other equivalent structures can be substituted for the sapphire tip. For example, depending upon the particular application, the optical scanning element 41b can use CCD or active laser technology, as just two examples. Active laser technology usually allows a greater operative scanning range, but has greater power requirements.

The illustrated communications interface employs two electrical contacts 42a, 42b exposed on top of the key 12, but other coupling arrangements (e.g. more than two contacts, inductive coupling, optoelectronic coupling, etc.) can alternatively be used. In other embodiments, key 12 can include a small alphanumeric display (e.g., LCD) and/or one or more indicator lights (e.g., LEDs).

Contacts 42a, 42b connect to corresponding elements on the vault lid 18 (not shown), as described below. The communications interface 40 bidirectionally couples data signals between the key 12 and lid 18 in the form of modulation on a power signal provided from the electronic key 12 to lid 18. Key 12 can serve not only as an access key for the vault 16, but also as a data link--relaying data to and from the vault 16.

CPU 26 can be an Intel microcomputer (e.g. 80C52) that controls operation of the key according to programming instructions permanently stored in ROM 30. The calendar/clock circuit 34 provides data corresponding to the year, month, day, and time.

The illustrated RAM 28 is comprised of a small RAM memory inside the calendar/clock circuit 34, together with 2 EEPROMS, the latter of which can store 2048 (2K) 8-bit bytes of data.

Transducer 36 is used to provide audible feedback to the user signaling a variety of key conditions. The transducer can also be used for frequency shift keyed relaying of data from the key to external devices (e.g. through an audio telephone circuit).

Battery 32 can comprise three AAA cells which provide power to the key circuitry and, through contacting elements 42, to vault lid 18 as well.

Figs. 4-6 show an electronic key 12' according to a second embodiment. The key 12' is similar to the key 12, except that the case 13', display 14' and key pad 24' are shaped differently, and the key 12' includes an infrared transmitter or transceiver 43 that allow the key to communicate with secured access devices and to transfer data optoelectronically. In the key 12', the infrared transceiver 43 is positioned on the case 13' between the contacts 42a, 42b. In the block diagram of Fig. 2, the infrared transceiver 43 is embodied as part of the communications interface circuitry 40.

Fig. 7 shows an electronic key 12" according to a third embodiment. The key 12" is similar to the key 12', but in the key 12", the bar code scanning element 41b is attached to a pivoting member 45. The pivoting member 45 is attached to a side of the case 13 such that it can be pivoted outwardly to its operative position as shown in Fig. 7 or pivoted inwardly to its closed position within the outline of the case 13. The pivoting member 45 allows for scanning in some applications where clearances or interference might make use of the key 12 or the key 12' difficult.

A suitable stand 80 shaped to receive the key 12' (or the key 12") is shown in Figs. 8-10. The stand 80 has a key receiving portion 82, contacts 84a, 84b (corresponding to the contacts 42a, 42b, respectively) and a telephone line connection 86 to a computer (not shown). The stand is used to download access and scanned data from the key (via the contacts 42a, 42b and the contacts 84a, 84b) over the connection 86 to the computer. The stand 80 can be configured to begin the downloading process automatically, i.e., without requiring the user to intervene (e.g., by pressing a button or similar operation), when the key 12' is received in the stand 80.

Optionally, the connection 86 and the stand 80 can be used to upload information to the key 12'. One type of such information is programming updates to the key 12' functions. The stand can also be connected to a suitable power source and fitted with an appropriate AC/DC converter to recharge the battery 35, if desired.

The keys 12, 12' and 12" as described above are dedicated devices, i.e., they function as secured access devices and optical scanners. However, it is also possible to embody all of the key and scanner functionality together in other handheld appliances, such as personal digital assistants and cellular telephones.

Having described the principles of my invention with reference to illustrative embodiments and certain variations thereon, it will be recognized that the invention is not so limited but can be modified in arrangement and detail without departing from such principles. Accordingly, I claim as my invention all such

modifications as may fall within the scope and spirit of the following claims, and equivalents thereto.

**I CLAIM:**

1. A key for accessing an electronic lock, the key including a user interface and a first memory, the first memory serving to store access data detailing identities of locks accessed by the key, the key further including an optical scanner and a second memory that stores data scanned by the scanner, the key further including a shared data transfer circuit by which both the access data and the scanned data can be downloaded from the key.
2. The key of claim 1, wherein the first and second memories comprise different storage elements within a shared memory circuit.
3. The key of claim 1, wherein the shared data transfer circuit includes an infrared port through which data can be transmitted from and received by the key.
4. The key of claim 1, wherein the shared data transfer circuit includes at least one contact on the key through which data can be transmitted from and received by the key when the key is connected by the contact to another device.
5. The key of claim 1, wherein the user interface includes a keypad.
6. The key of claim 1, wherein the user interface includes a display screen.
7. The key of claim 1, wherein the optical scanner is a bar code reader configured to read bar codes.
8. The key of claim 1, wherein the key includes a case and the optical scanner includes an optical scanning element connected to an optical scanning circuit, and wherein the optical scanning element is positioned within the case adjacent a side thereof.
9. The key of claim 8, wherein the case is generally rectangular, and wherein the optical scanning element is positioned adjacent a corner thereof.

10. The key of claim 1, wherein the key includes a case with a pivoting element and the optical scanner includes an optical scanning element connected to an optical scanning circuit, the optical scanning element being attached  
5 to the pivoting element, and the pivoting element being positionable in at least a first operative position pivoted outward from the case and a second storage position pivoted within the case.

11. A key for accessing an electronic lock, the key including a user  
10 interface and a memory, the memory serving to store access data detailing the identities of locks accessed by the key, the key further including a bar code scanner, the memory also serving to store bar code data output by the scanner.

12. A key for accessing an electronic lock, the key including a user  
15 interface and a memory, the memory serving to store access data detailing the identities of locks accessed by the key, the key further including a button that is operable to switch the key from an access mode to an optical scanning mode.

13. The key of claim 12 in which the user interface includes at least  
20 one button whose functionality is changed by switching the key from the access mode to the optical scanning mode.

14. A method comprising:  
equipping the driver of a delivery truck with a hybrid electronic  
25 key/optical scanner device;  
using the hybrid device to gain access to a locked door at a customer site;  
logging access data within the hybrid device, the access data indicating the identity of the customer site;  
30 delivering one or more packages from the truck, through the door, to the customer site;  
scanning optical data on the packages using the hybrid device;  
logging the scanned optical data within the hybrid device; and  
later downloading both the access data and the scanned optical data  
35 from the hybrid device to at least one database.

15. An access and scanning system, comprising:
- an electronic key for accessing an electronic lock, the key comprising a  
optical scanner that scans optical data, the key further comprising a memory that  
stores scanned optical data and lock access data and a data transfer circuit over which  
5 the stored data can be transferred;
- a stand having a receiving portion within which the electronic key is  
engageable that makes an electrical connection with the data transfer circuit of the  
electronic key, the stand having a link to a remote computer over which data can be  
exchanged between the key and the remote computer, wherein when the key is  
10 engaged within the stand, the stored data in the key can be automatically uploaded to  
the remote computer over the link.

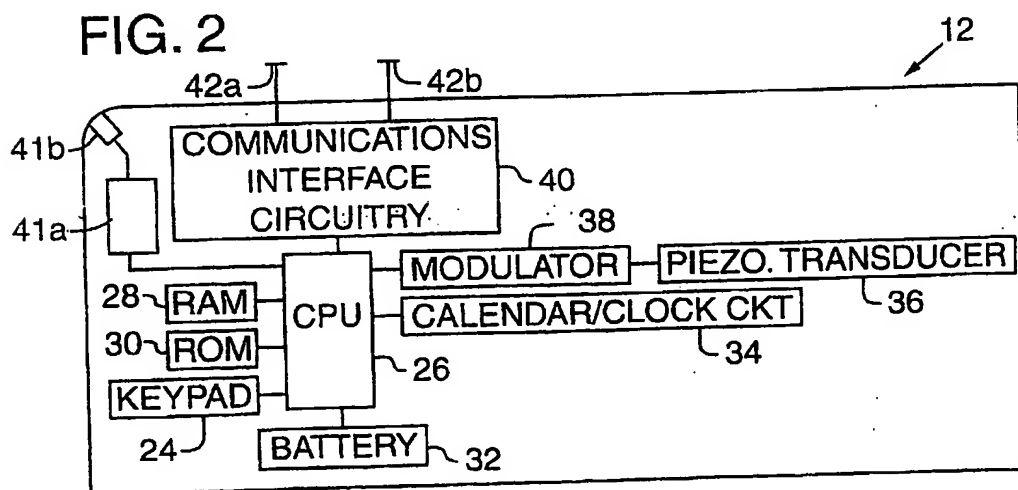
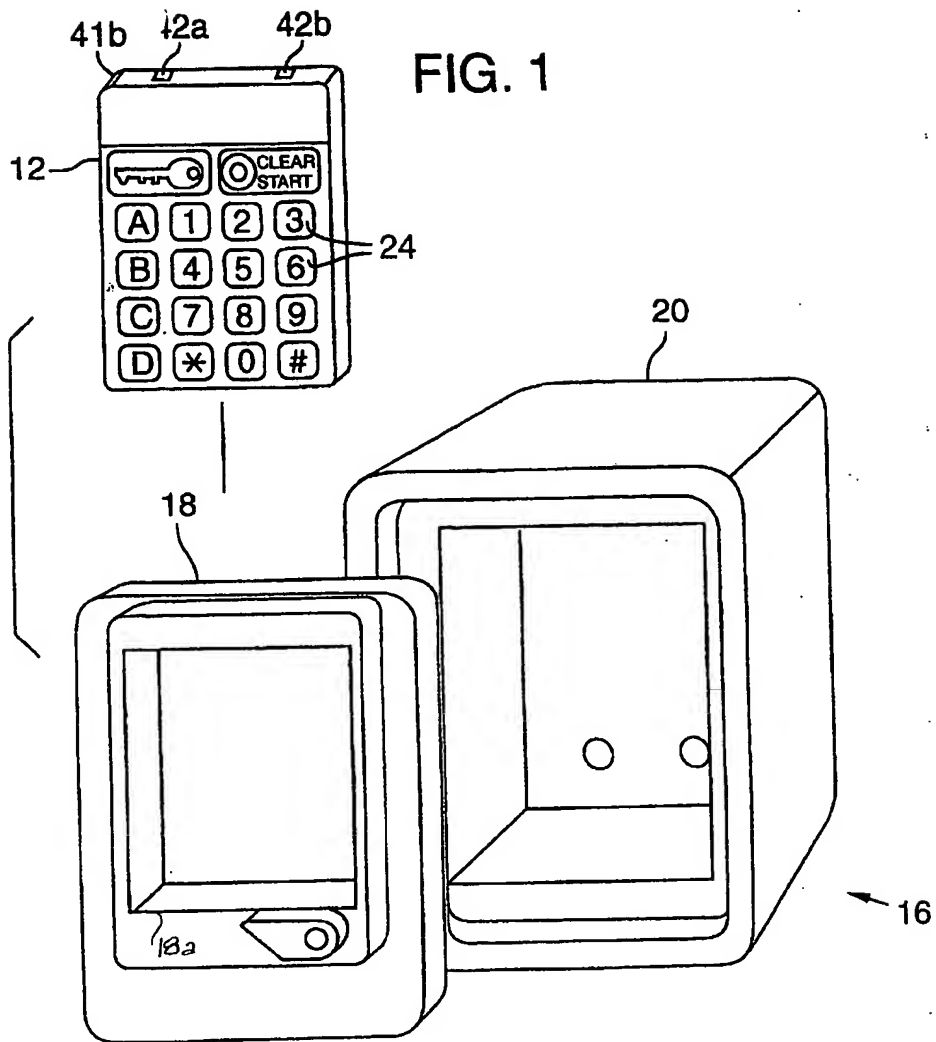
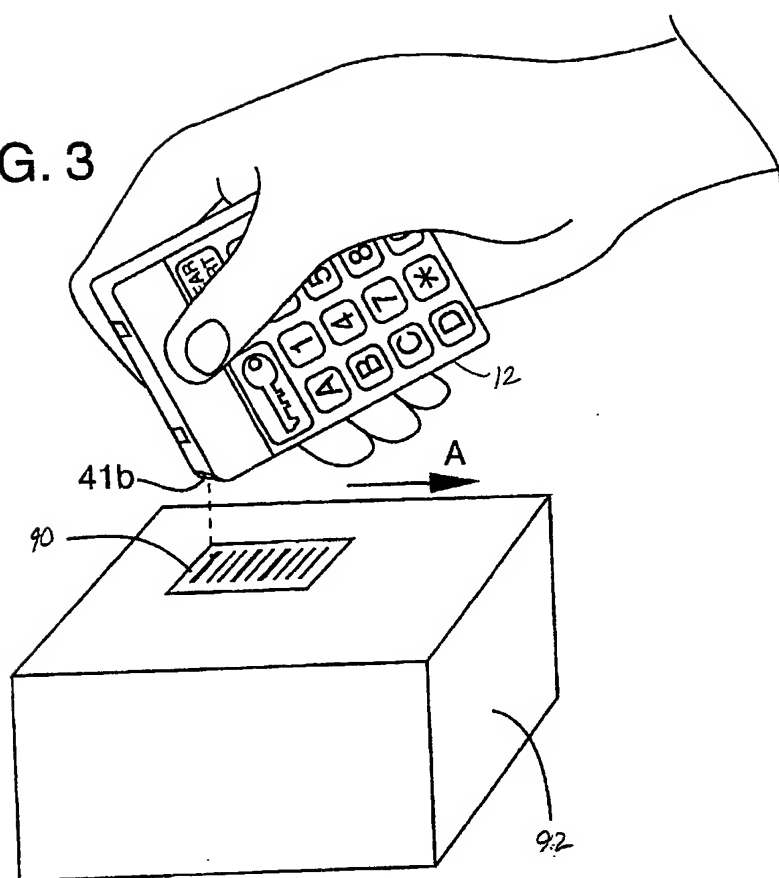


FIG. 3



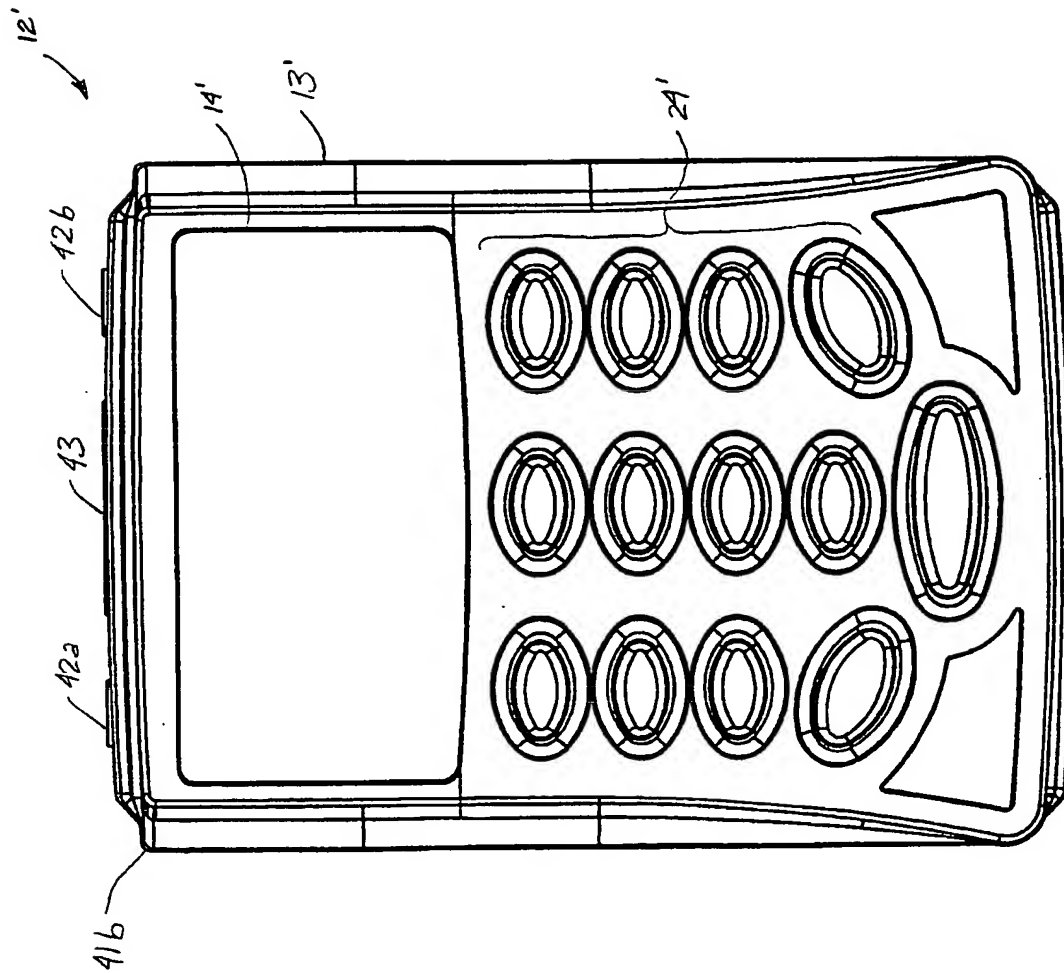


FIG. 4

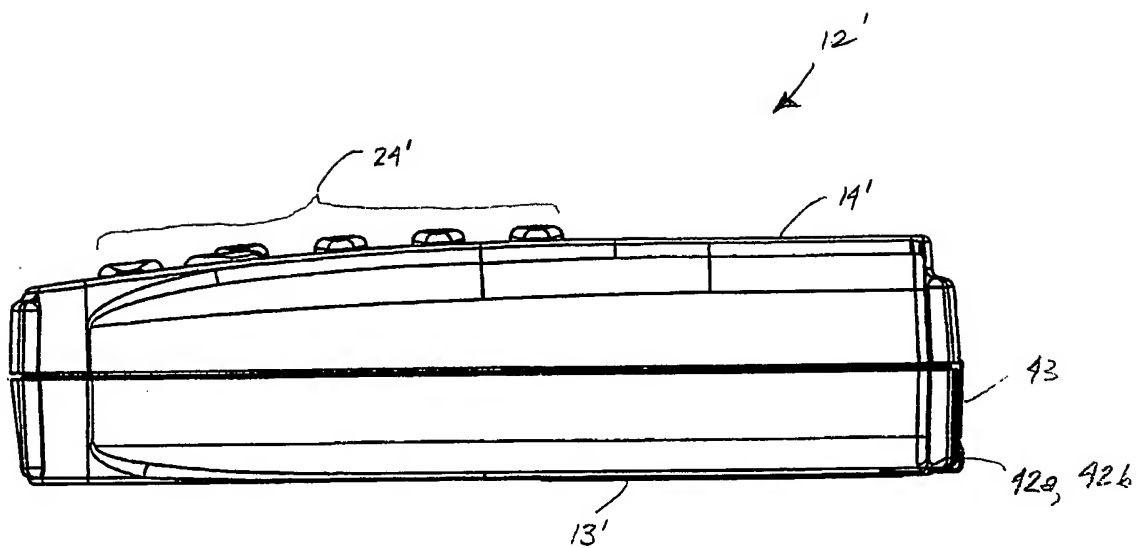
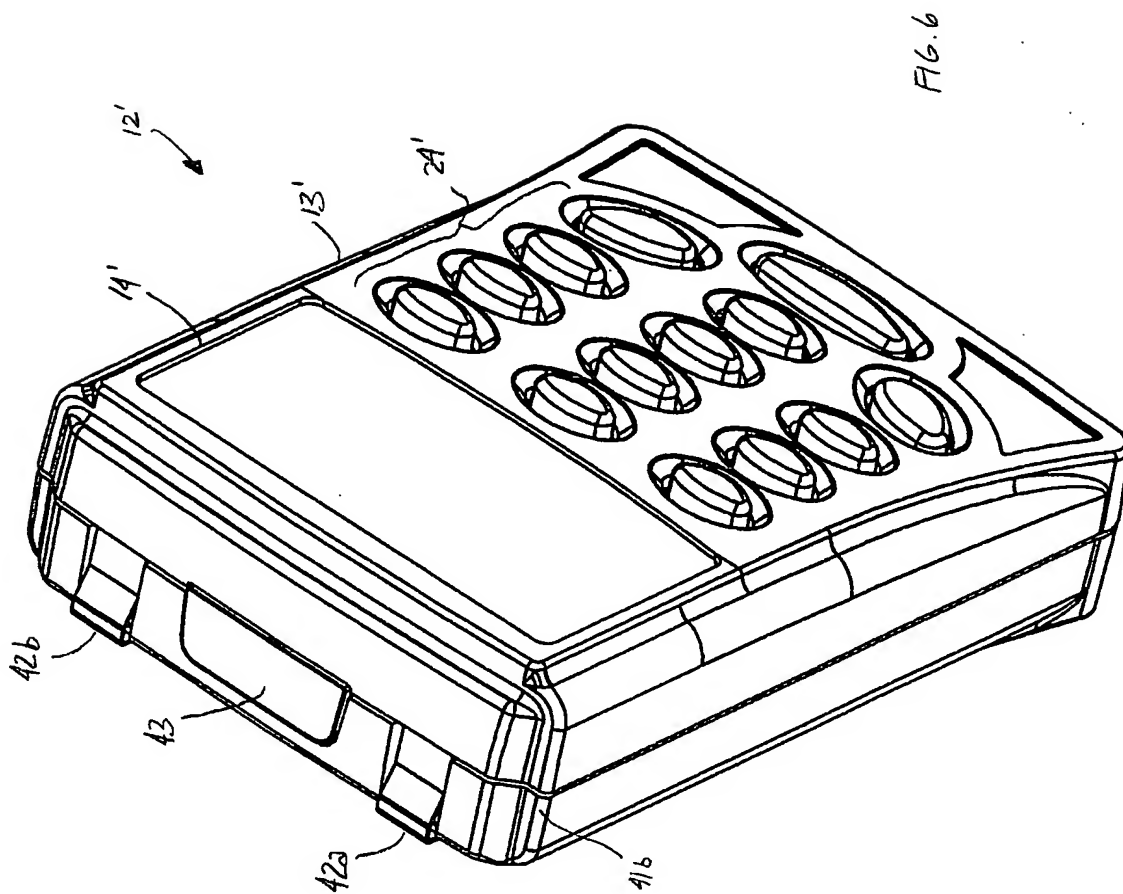


FIG. 5



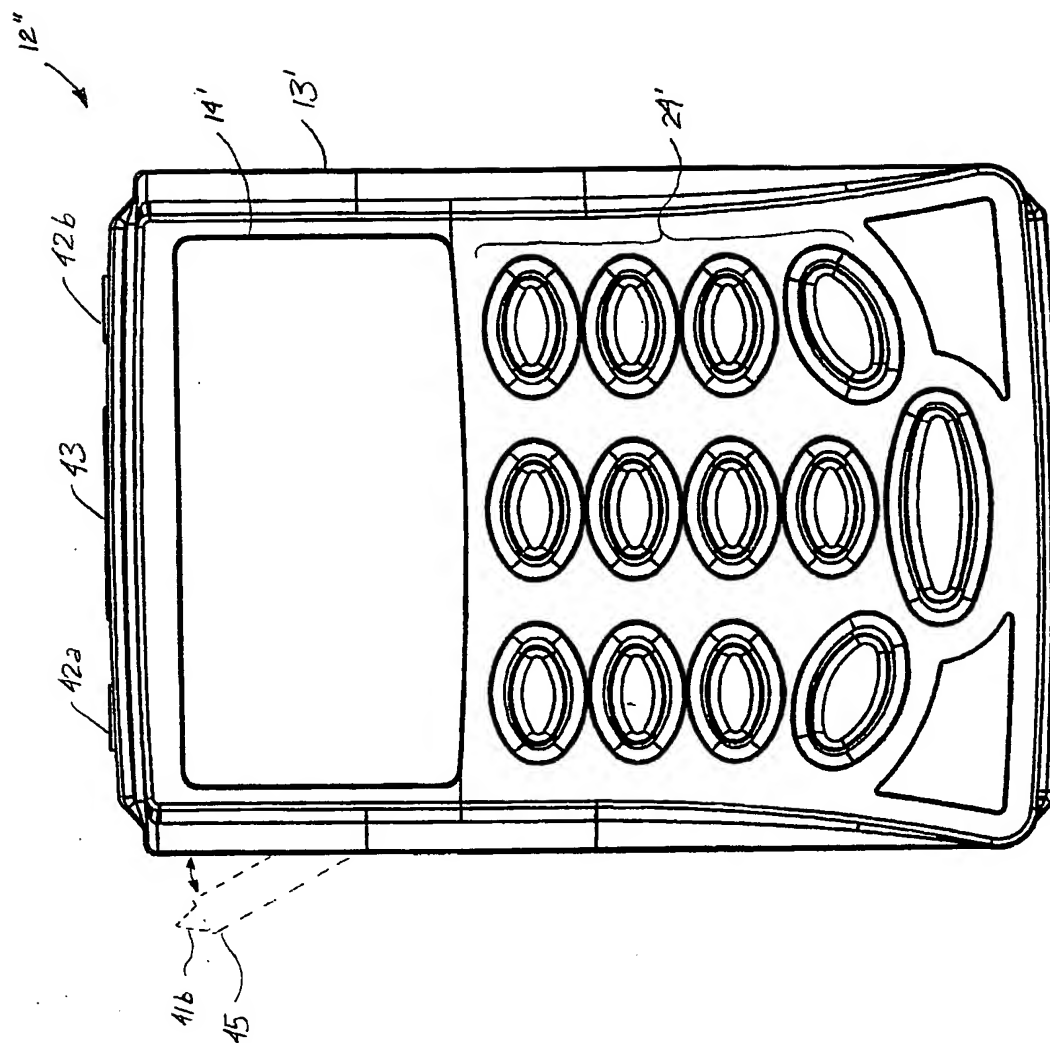


FIG. 7

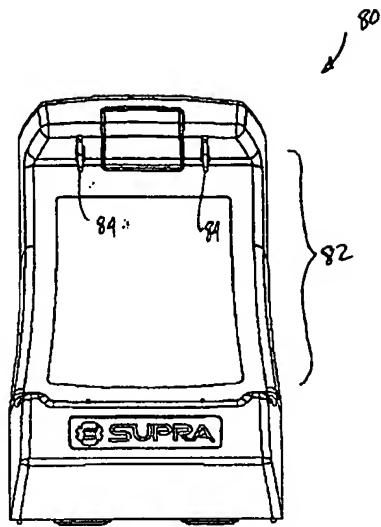


FIG. 8

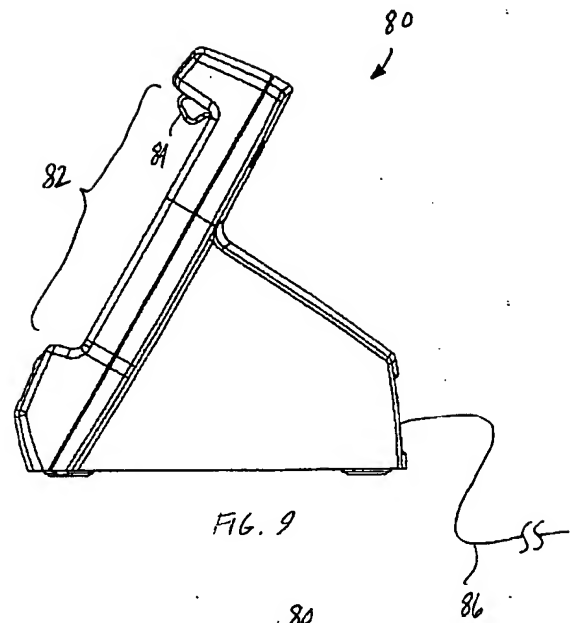


FIG. 9

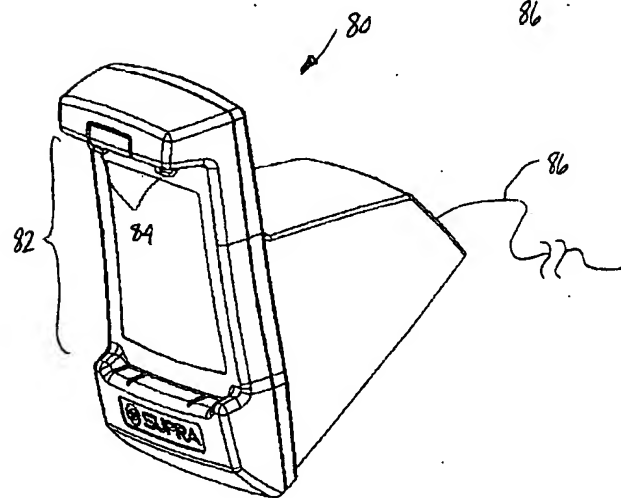


FIG. 10

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 00/17139

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E05B49/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E05B A47G G07C G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 97 35442 A (BIANCO JAMES S) 25 September 1997 (1997-09-25) abstract page 12, line 34 -page 13, line 21 claims 1,2; figures 11,12	1,4-9, 11-15
Y	EP 0 855 673 A (EASTMAN KODAK CO) 29 July 1998 (1998-07-29) abstract page 3, line 23 -page 4, line 53 page 6, line 2 - line 7 claims 1,2; figures 1,2,6	1,4-9, 11-15
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 00/17139

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 561 949 A (ARC SERVICES) 4 October 1985 (1985-10-04) abstract page 2, line 8 -page 4, line 13 page 12, line 6 - line 22 claims; figures	1,3-7, 14,15
A	US 5 661 291 A (AHEARN KEVIN JOHN ET AL) 26 August 1997 (1997-08-26) abstract column 4, line 18 - line 50 column 5, line 12 -column 6, line 26 figures 1,3,4	1,5-7, 14,15
A	CH 673 164 A (HTP HIGH TECHNOLOGY PARTNERS A) 15 February 1990 (1990-02-15) abstract; claims; figures	1,5-7,15
A	EP 0 818 725 A (HAND HELD PRODUCTS INC) 14 January 1998 (1998-01-14)	

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Int'l Application No  
PCT/US 00/17139

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